DOCUMENT RESUME

ED 200 447 SE 034 601

AUTHOR Novak, John A.; Voss, Burton E.
TITLE An Investigation of Relationships Between Cognitive Preference Orientation and Jungian (MBTI) Personality Types of Eighth-Grade Science Students.
PUB DATE Apr 81
NOTE 17p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (54th, Grossinger's in the Catskills, Ellenville, NY, April 5-8, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cognitive Processes; *Cognitive Style; Grade 8; *Inquiry; Intelligence Differences; Junior High School Students; *Personality Studies; Personality Traits; Science Education; Secondary Education; Secondary School Science; Sex Differences; *Student Characteristics
IDENTIFIERS *Cognitive Preference; Early Adolescents; Myers Briggs Type Indicator; *Science Education Research

ABSTRACT

This study was undertaken to determine the cognitive preference orientation (measured by the Cognitive Preference Examination II) and Jungian personality types (measured by the Myers Briggs Type Indicator, MBTI) of 283 eighth-grade students. Relationships between these two variables were predicted. It was hypothesized that introverted, intuitive thinking and perceiving MBTI personality types would exhibit an application, questioning, or application/questioning cognitive preference orientation, that is, an inquiry orientation toward learning. It was further hypothesized that extraverted, sensing, feeling and judging MBTI personality types would exhibit a memory, memory/application, or memory/questioning cognitive preference orientation, that is, a traditional orientation toward learning. This study also attempted to determine if students differed on these measures according to sex or intelligence. The predicted relationships were not supported by the analyses in the study. Differences between the sexes were not noted. Differences in intelligence between sensing and intuitive students (in favor of intuitives), between judging and perceiving students (in favor of perceivers), and between students classified according to cognitive preferences were found. It is suggested that data from individual measures may give classroom teachers better insight into the individual differences of their students. (Author)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED200447

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

John A. Novak

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

AN INVESTIGATION OF RELATIONSHIPS BETWEEN COGNITIVE PREFERENCE ORIENTATION AND JUNGIAN (MBTI) PERSONALITY TYPES OF EIGHTH-GRADE SCIENCE STUDENTS

John A. Novak
The Ohio State University
Columbus, Ohio 43210

Burton E. Voss
The University of Michigan
Ann Arbor, Michigan 48109

Presented at
National Association for Research in Science Teaching
Annual Meeting
Grossinger's
April 1981

SE 034 601

Rationale:

The cognitive preference dimension of cognitive style as conceptualized by Heath (1964) has been used extensively to evaluate various high school science curricula. Recent studies have focused on validating the cognitive preference construct (van den Berg, et al., 1980), alternative interpretations of cognitive preference findings (Jungworth, 1980), and examining relationships between cognitive preferences and selected variables, e.g., learning styles and intelligence (Ben Zvi, et al., 1980). However, little attention has been given to an examination of the relationships between cognitive preference orientation and personality attributes (Williams, 1975), with possible implications for curriculum and instruction in science.

Cognitive preference orientation as used in this study refers to a preference for the recall (M), application (A), or critical questioning/challenging (Q) of information; a combination of preferences (MA, MQ, AQ); or no determinable preference (NP). A preference for M (or M in combination with A or Q, i.e., MA and MQ) would characterize a preference for traditional learning. A preference for A, Q, or AQ would characterize a preference for inquiry learning.

Jungian (MBTI) personality types refer to one of two types across each of four dimensions. An examination of the salient features of the types indicates characteristics of either inquiry* or traditional** learning.

Extravert (E) or Introvert (I):

E: preferring to focus on people and things**

I: preferring to focus on concepts and ideas*

Sensing (S) or Intuition (N):

S: fact-centered; interest in facts and details**

N: problem-centered; interest in possibilities and relationships*

Thinking (T) or Feeling (F):

T: analytical and impersonal decisions *

F: decisions based on value judgments **

Judging (J) or Perceiving (P):

J: structure-centered; goal-oriented*

P: open-minded; flexible**

Purpose:

This study was undertaken to determine:

1. the cognitive preference orientation and Jungian (MBTI) personality types of eighth-grade science students;
2. predicted relationships between these variables;
   a. It was hypothesized that I, N, T, and P MBTI personality types would exhibit an A, Q, or AQ cognitive preference orientation, i.e., an inquiry orientation toward learning.
   b. It was further hypothesized that E, S, F, and J MBTI personality types would exhibit an M, MA, or MQ cognitive preference orientation, i.e., a traditional orientation toward learning.
3. if students differed on these measures according to sex or intelligence.

Procedure:

Data Collection-

Data were collected from 283 (153 male and 130 female) eighth-grade students who volunteered to participate in the study.

Cognitive Preference Orientation-

Students were classified as having (1) a single, definable preference or (2) a combination of preferences based on the Cognitive Preference Examination II- CPE-II (Atwood, 1971) scores.

Students were placed into one of three categories (M, A, or Q) if they selected a minimum of 13 (one less than one-half the number of preference items) items of a given preference, while choosing any other preference on a maximum of 7 items. Students who did not meet this criterion were categorized as NP. Students were also placed into categories on the basis of two preference scores (MA, MQ, or AQ) by selecting each of two preferences on a minimum of 10 items. Students who did not meet this criterion were categorized as NP.

Reliabilities of 0.77 (A), 0.70 (M), and 0.74 (Q), indicated by Pearson product-moment, test-retest stability coefficients were reported by Atwood (1971). The 27 items on the CPE-II (plus three distractors) were judged to be valid by a panel of judges composed on one person in science education, one person in social science education, and one person in educational research.

The CPE-II was modified to adjust for reading levels of eighth-grade students. Womer (1979) has indicated that the reliability and validity of an item would not be significantly affected by altering words in a given item, unless the item was used for comparison with national norms. Five junior high/middle school teachers examined the modified CPE-II. Although they agreed that the CPE-II was acceptable for use with eighth-grade students, all offered a similar caveat: Many junior high school students might not have immediate recognition of content material on any cognitive preference test, just as they might have difficulty remembering material for a teacher-prepared test.

Jungian (MBTI) personality types:

Students were classified as E or I, S or N, T or F, and J or P based on Myers-Briggs Type Indicator (MBTI) scores. The test instrument is a 166-item, forced-choice, self-administering questionnaire. Form F, used in this study, consists of 114 forced-choices between two or three phrases or sentences and 52 forced-choices between a pair of words to determine which appeals more to the individual.

Eight separate keys were used to hand-score each test, one key for each preference. Individual items carry point values of one or two. The higher score of a given preference purports to represent the preferred process of that preference.

By applying the Spearman-Brown prophecy formula to the MBTI, Myers (1962) reported split-half reliabilities ranging from .70 to 0.94 on all four indices, with the exception of 0.44 and 0.60 on the TF index of under-achieving eighth-graders and a non-college prep twelfth-grade sample. Validation of the instrument is presented in detail in Myers (1962) and summarized by Mendelsohn (1965) and Sundberg (1965).

Intelligence scores:

This investigator was not permitted to give an intelligence test to the students in the study nor were records of intelligence quotients (IQ) maintained in student records. However, Womer (1979) and Ebel (1972) have indicated that an IQ score is essentially a measurement of vocabulary meaning. Therefore, the vocabulary score for each student from Form D of the Gates-MacGinitie Reading Tests was provided by the schools. The Technical Manual (1965) of the reading tests indicated a correlation of

0.77 between the vocabulary scores of the test (Form D) and the Lorge-Thorndike Verbal IQ.

Using the conversion factor indicated by Womer (1979), each vocabulary scores was converted to a z-score and multiplied by 15. If the z-score was positive, the converted z-score was added to 100 to obtain the derived IQ score. If the z-score was negative, the converted z-score was subtracted from 100 to obtain the derived IQ score.

Results:

A. The cognitive preference results classified 278 students into groups based on a single preference (Table 1) and on a combination of two preferences (Table 2).

B. The MBTI results classified 271 students according to their E or I, S or N, T or F and J or P preferences as indicated in Table 3.

C. The chi-square analyses of MBTI personality types EI, SN, TF, and JP and cognitive preference orientation M, A, Q and MA, MQ, AQ were not significant at $p \leq .05$. The NP category was not used in these analyses (Table 4).

   The chi-square analyses for sex and cognitive preference orientation, and MBTI personality types were also not significant at $p \leq .05$ (Table 5).

D. Statistically significant differences in intelligence were found between sensing and intuitive students, in favor of intuitives; and between judging and perceiving students, in favor of perceiving types ($p \leq .001$) as indicated in Table 6.

   A statistically significant difference in intelligence was also found between students classified according to a single cognitive preference ($p \leq .05$) as seen in table 7.

Conclusion and Discussion:

The predicted relationships that I, N, T, and P MBTI personality types would exhibit an inquiry cognitive preference orientation (A, Q, AQ) and that E, S, F, and J MBTI personality types would exhibit a traditional cognitive preference orientation (M, MA, MQ) were not supported by the analyses in this study.

TABLE 1

COGNITIVE PREFERENCE ORIENTATION

SINGLE PREFERENCE

PREFERENCE	N	PERCENT
M	14	5.0%
A	34	12.3%
Q	10	3.5%
NP	220	79.1%
	278	100.0%

M- PREFERS TO RECALL INFORMATION

A- PREFERS INFORMATION IN VIEW OF ITS APPLICABILITY

Q- PREFERS TO QUESTION OR CHALLENGE INFORMATION

NP- No DETERMINABLE PREFERENCE

TABLE 2

COGNITIVE PREFERENCE ORIENTATION

TWO PREFERENCES

PREFERENCE	N	PERCENT
MA	112	40.3%
MQ	58	20.8%
AQ	60	21.6%
NP	48	17.3%
	278	100.0%

M- PREFERS TO RECALL INFORMATION

A- PREFERS INFORMATION IN VIEW OF ITS APPLICABILITY

Q- PREFERS TO QUESTION OR CHALLENGE INFORMATION

NP- NO DETERMINABLE PREFERENCE

TABLE 3
MBTI GROUPINGS

EXTRAVERT/INTROVERT:

E:	153	56.5%
I:	118	43.5%

SENSING/INTUITION:

S:	174	64.2%
N:	97	35.5%

THINKING/FEELING:

T:	88	33.6%
F:	180	66.4%

JUDGING/PERCEIVING:

J:	99	36.5%
P:	172	63.5%

TABLE 4

ANALYSIS OF MBTI PERSONALITY TYPES ACCORDING TO COGNITIVE PREFERENCE ORIENTATION

PERSONALITY TYPE	COGNITIVE PREFERENCE ORIENTATION	x^2	Cc
EI	M,A,Q	0.85	0.12
EI	MA,MQ,AQ	2.56	0.11
SN	M,A,Q	0.36	0.08
SN	MA,MQ,AQ	2.05	0.12
TF	M,A,Q	0.27	0.07
TF	MA,MQ,AQ	0.49	0.05
JP	M,A,Q	0.54	0.14
JP	MA,MQ,AQ	0.40	0.05

TABLE 5

ANALYSIS OF SEX AND (1) MBTI PERSONALITY TYPES AND (2) COGNITIVE PREFERENCE ORIENTATION

PERSONALITY TYPE	SEX	x^2	Cc
EI	MF	9.55	0.18
SN	MF	1.02	0.06
TF	MF	3.66	0.12
JP	MF	0.27	0.03

COGNITIVE PREFERENCE ORIENTATION	SEX	x^2	Cc
M,A,Q	MF	0.36	0.08
MA,MQ,AQ	MF	0.32	0.04

TABLE 6

ANALYSIS OF VARIANCE OF MEAN INTELLIGENCE SCORES FOR EI, SN, TF, AND JP MBTI PERSONALITY TYPES

PERSONALITY TYPE	INTELLIGENCE			
	N	MEAN	SD	F
E	153	100.75	14.52	0.78
I	118	99.13	15.67	
S	174	96.56	13.77	28.89***
N	97	106.30	15.23	
T	91	101.40	15.96	1.11
F	180	99.36	14.53	
J	99	95.49	14.38	15.12***
P	172	102.67	14.85	

***$p \leq .001$

TABLE 7

ANALYSIS OF VARIANCE OF MEAN INTELLIGENCE SCORES OF STUDENTS CLASSIFIED ACCORDING TO COGNITIVE PREFERENCE ORIENTATION M,A,Q AND MA,MQ,AQ

COGNITIVE PREFERENCE ORIENTATION	INTELLIGENCE N	MEAN	SD	F
M	14	92.21	10.40	
A	34	103.18	15.04	4.37*
Q	10	104.50	15.81	
MA	114	96.65	15.69	
MQ	59	99.49	13.21	2.18
AQ	62	101.54	15.18	

*$p \leq .05$

As in this study, previous studies have demonstrated significant differences in intelligence between sensing (S) and intuitive (N) students (May, 1971) and between students classified according to cognitive preference orientation (Ben Zvi, et al., 1980). It is suggested that additional studies are needed to clarify the relationship between intelligence and these measures.

Studies have also shown insignificant differences between the sexes on EI, SN, and JP measures but not between TF of the MBTI. In general, males tend to prefer decision-making by logical and impersonal analysis (T) and females tend to prefer decision-making based on value judgments (F). As seen in this study, there was no significant difference between males and females on the TF scale. This may be indicative of a trend suggested by McCaulley (1976), a shift (in females as well as in males) reflecting a general shift toward humanistic values in today's society. This may be due to an acute awareness of environmental and energy concerns.

Although predicted relationships were not supported in this study, it is suggested that the individual test instruments may offer some insight into the characteristics of eighth-grade science students.

Based on the data from cognitive preference testing, it is postulated that three types of students may be identified in science classrooms:

1. Traditionalists- These are students who exhibit either a strong memory (M) cognitive preference orientation or memory (M) in combination with application (A) or questioning (Q). These students prefer the recall of information and may resist an inquiry approach. They may be served best by a traditional approach to science teaching, the way most teachers do teach.
2. Natural Inquirers- These are students who exhibit a questioning (Q) and application (A) cognitive preference orientation. These students may be "inquiry-minded" and find traditional approaches somewhat tedious.
3. Undecided- These are students who do not exihbit a determinable cognitive preference orientation. As in this study, these students are probably in the majority in most classrooms. It is these students who may be the most influenced by a particular curriculum and teaching style associated with it. It is suggested that these students may become inquirers if they are taught by a teacher who is inquiry-

oriented (open, indirect teacher behavior). These same students may also be influenced by a traditional approach (fact-centered, direct teacher behavior).

In addition, it is strongly suggested that the MBTI personality types of eighth-graders be examined in and of themselves as possible indicators of inquiry and traditional orientations toward learning in science. It was found that students in this study were similar to students in another study (May, 1971) although the samples were separated both by space (Michigan vs. Florida) and time (1980 vs. 1971) as indicated in Table 8. If it can be shown that MBTI types have a similar distribution among different eighth-grade samples of science students and that type influences a specific orientation toward learning, this information could be used to adjust curriculum and instructional strategies to continue to meet the individual needs of students who, for many, may be in their last science class.

TABLE 8

ANALYSIS OF THE FREQUENCY DISTRIBUTIONS OF THE EI, SN, TF, AND JP MBTI PERSONALITY TYPES IN MAY'S (1971) AND NOVAK'S (1980) STUDIES

PERSONALITY TYPE	MAY- 1971		NOVAK-1980		x^2
E	172	58.3%	153	56.5%	0.22
I	123	41.7%	118	43.5%	
S	192	65.1%	174	64.2%	0.05
N	103	34.9%	97	35.8%	
T	88	29.8%	91	33.6%	0.92
F	207	70.2%	180	66.4%	
J	128	43.4%	99	36.5%	2.77
P	167	56.6%	172	63.5%	

References

Atwood, Ronald K. "Development of a Cognitive Preference Examination Utilizing General Science and Social Science Content." Journal of Research in Science Teaching, 1971, 8: 173-175.

Ben Zvi, Ruth; Hofstein, Avi; Salomon, Yetty; and Samuel, David. "Cognitive Preferences and Modes of Instruction in High School Chemistry." Journal of Research in Science Teaching, 1979, 16: 569-574.

Ebel, Robert L. Essentials of Educational Measurement. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972.

Gates, Arthur I. and MacGinitie, Walter H. Technical Manual, Gates- MacGinitie Reading Tests. New York: Teachers College Press, 1965.

Heath, Robert W. "Curriculum, Cognition and Educational Measurement." Educational and Psychological Measurement, 1964, 34: 239-253.

Jungworth, Ehud. "Alternative Interpretations of Findings in Cognitive Preference Research in Science Education." Science Education, 1980, 64: 85-94.

May, Daryle C. "An Investigation of the Relationships Between Selected Personality Characteristics of Eighth-Grade Students and Their Achievement in Mathematics." Unpublished doctoral dissertation. University of Florida, Gainesville, Florida, 1971.

McCaulley, Mary H. "Personality Variables: Model Profiles That Characterize Various Fields of Science." In Birth of New Ways to Raise a Scientifically Literate Society: Research That May Help. Edited by M.B. Rowe. Symposium presented at the Annual Meeting of the American Association for the Advancement of Science, Boston, Mass., February, 1976.

Mendelsohn, Gerald A. "The Myers-Briggs Type Indicator." In Sixth Mental Measurements Yearbook. Edited by O.K. Buros. Highland Park, New Jersey: Gryphon Press, 1965.

Myers, Isabel Briggs. Manual: The Myers-Briggs Type Indicator. Palo Also, California: Consulting Psychologists Press, 1962, 1975.

Sundberg, Norman. "The Myers-Briggs Type Indicator." In Sixth Mental Meassurments Yearbook. Edited by O.K. Buros. Highland Park. New Jersey: Gryphon Press, 1965.

van den Berg, Euwe; Lunetta, Vincent; and Pinchas Tamir. "The Convergent Validity of the Cognitive Preference Construct." Paper presented at the Annual Meeting of the National Association for Research in Science Teaching. Boston, Mass., April 1980.

Williams, Clive. "A Study of Cognitive Preferences." The Journal of Experimental Education, 1975, 43: 61-78.

Womer, Frank B. personal communications.